The Solow Model, Poverty Traps, and the Foreign Aid Debate

Brian Snowdon

> The neoclassical model is still the most useful theory of growth we have. It will continue to be the first growth model taught to students and the first growth model used by policy analysts.
> —Gregory Mankiw, "The Growth of Nations" (1995)

The 1940s and 1950s were an exciting and remarkably productive period in the fields of economic development and economic growth. A rich and prolific literature featured some of the most influential and well-known contributions in the history of economics. Discussions of economic development were dominated by "Big Ideas" relating to balanced growth, low-level traps, vicious circles, cumulative causation, dualism, savings ratios, big push, leading sectors, elasticity pessimism, import substitution, economic planning, take-offs into self-sustained growth, and foreign aid requirements (see Meier 2005).

Against this background, by far the most influential and durable contribution to the analysis of economic growth was Robert Solow's 1956 paper, "A Contribution to the Theory of Economic Growth," which established the benchmark neoclassical growth model. Solow's landmark paper remains "one of those rare pieces which quite literally changed the face of

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economics and launched a thousand theoretical ships" (Blinder 1989). One important theoretical ship that has recently set sail again is the idea that some very poor countries appear to be caught in a poverty trap requiring a "big push" from foreign aid in order to escape. A case in point is a 2004 article by Jeffrey Sachs and colleagues; as discussed later in this article, Sachs et al. make extensive use of a modified Solow model to provide theoretical support for increasing the flow of foreign aid to sub-Saharan Africa (SSA). There is a strong similarity between Sachs et al. 2004 and Richard Nelson's influential paper from 1956, the same year in which Solow's contribution appeared. Nelson's model of a "low level equilibrium trap" persuaded many economists that developing countries would need substantial inflows of external assistance if they were to escape extreme poverty and begin the process of sustained growth.

The burgeoning contemporary research into the causes of economic growth, poverty traps, and convergence clubs, as well as the need to identify the deeper determinants of substantial cross-country differentials in income per capita, has brought the Solow model, and modifications thereof, into the heart of the contemporary development debate after decades of neglect in this field. This article reviews and provides a critical commentary on the literature relating to the Solow model, economic development, poverty traps, and the case for foreign aid as a solution to the SSA growth tragedy.

The Solow Model and the Economics of Development

The importance of economic growth as a necessary condition for sustained improvements in human material welfare and poverty reduction is confirmed by numerous empirical studies (Dollar and Kraay 2002). When it comes to investigating the proximate causes of growth, the dynamics of transition to steady states, and the potential for catch-up and convergence between low- and high-income per capita countries, Solow's model, together with subsequent extensions and refinements, has proved an invaluable and adaptable framework of analysis. The model is parsimonious, rigorous, and flexible, and provides many useful insights into the causes of economic growth (Mankiw 1995). And yet, although the neoclassical growth model was central to the 1960s growth accounting debates relating to the high-income developed nations, strangely, and in sharp contrast to the highly visible Harrod-Domar (H-D) model, compared with today, the

Solow growth model is largely inconspicuous in the mainstream development literature during the period 1956–85. For example, in the classic and widely used collections of readings edited by Amar Agarwala and Sampat Singh (1971, first published in 1958), and Ian Livingstone (1971), there is *no* discussion of the Solow model. Further evidence that the Solow model played little part in the early development literature comes from Diana Hunt, who in her 1989 survey notes that "neoclassical growth theory is not surveyed here, partly because it did not form part of the intellectual heritage of development economists in the 1940s and early 1950s, *but also because it has had no appreciable influence on development economics*" (34; emphasis added).

Why did development economics and growth theory evolve along separate paths for almost three decades in the post-1956 period? Building on Paul Krugman's (1992) insightful analysis, Solow (1999, 275) offers the following explanation:

> On the whole the personality types in the profession who became interested in economic development were not model builders. They were collectors of data and generalizers from rough empirical data, like Simon Kuznets; or they were like Ted Schultz, really deeply into underdeveloped agriculture, or they were people interested in history and backwardness for its own sake. That sort of temperament is not suited to model building. Growth theory *par excellence*, yielded to model building. So even Arthur Lewis thought of his 1954 paper as a minor sideline to his book *The Theory of Economic Growth* (1955). The people who got interested in the theory of economic growth were interested in model building.

Today the situation is very different. Since the mid-1980s, interest in the Solow model, and model building in general, among development economists has revived. Although the H-D model still finds a place in most development textbooks, it rarely warrants much more than a passing comment in modern macro or growth textbooks (e.g., compare the brief discussion in Barro and Sala-i-Martin 2004 with the extensive treatment in Jones 1975). Unlike the years of "high development theory" (Krugman 1992), the Solow model now receives extensive treatment in most textbooks on economic development (e.g., compare Higgins 1959 with Perkins, Radelet, and Lindauer 2006). In large part this can be attributed to the versatility of Solow's model and the insights it provides on the convergence-divergence debate (Islam 2003). Although dominated by the Solow and

Romer models, another notable change is the welcome and growing tendency in macro and growth textbooks to give increasing attention to the "deeper" political economy determinants of growth and development (see, e.g., Acemoglu 2008).

What were the main influences that led Solow (2007, 4) into the research that culminated in his 1956 "contribution to the theory of economic growth"? According to Solow (1999), he became interested in growth for three main reasons. First, in the early 1950s many economists were becoming increasingly absorbed in the daunting economic problems facing the developing countries. However, in terms of his own research, Solow became "passively" rather than "actively" interested in economic development ("I got to thinking about development issues and I had read Arthur Lewis"). Second, Solow's linear programming research with Robert Dorman and Paul Samuelson (1958) stimulated his thinking about intertemporal optimization and economic growth. Third, Solow (1999, 273–74) was "suspicious of the Harrod-Domar model. . . . I thought there must be a way of modelling growth that does not have the knife edge property of the Harrod-Domar model."

While Solow never intended his model to address the specific problems facing developing countries, it does provide a coherent framework for thinking about the connection between growth, capital accumulation, and economic development. Capital accumulation was already central in the 1950s development models of Harrod-Domar, Walt Rostow, Ragnar Nurkse, and Arthur Lewis (Meier 2005). However, when there are diminishing returns to the accumulation of capital, a policy emphasis on increasing investment-GDP ratios will not lead to sustained economic growth; rather, long-run growth is driven by (exogenous) technological progress. Therefore it is hardly surprising that Solow's one-sector neoclassical growth model failed to have a substantial impact on the development literature, given this was an era of development thinking heavily influenced by dual-sector models, surplus labor, structuralism, and "capital fundamentalism" (King and Levine 1994).[1]

In his thought-provoking tale of "economists' misadventures in the tropics," Bill Easterly (2001) provides a stinging critique of "capital fundamentalism." Because of diminishing returns, Solow's growth model contains

1. Mauro Boianovsky (2010) defines capital fundamentalism as "the notion that physical capital accumulation, instead of technical change or investment in human capital, determines the rate of growth of income per capita."

the "surprising" result that investment is not the key to long-run growth, even if it plays a role in the transition to the steady-state growth path. However, this "shocker" failed to influence the thinking of the development "experts" in the major international financial institutions who mistakenly continue to view the "accumulation of productive assets" as the "foundation of economic growth."

Augmenting the Solow Model: From Solow to Romer, Barro, and Mankiw

The revival of interest in growth theory and empirics since the mid-1980s has had a significant influence on the economic development literature as well as reigniting interest in the Solow model as a versatile framework for investigating the issue of convergence. While part of this revival of interest in growth analysis reflected the return of macroeconomic stabilization in the developed economies during the 1980s, it also reflects the intellectual stimulus provided by the new endogenous growth theories. Even though these models were more about developed than developing countries, in his seminal paper Paul Romer (1986) highlights the growing body of evidence supporting the lack of convergence in per capita incomes between developed and developing countries. This was a significant contributing factor influencing Romer's quest to construct a growth model based on increasing returns. Indeed, the existence of convergence and divergence clubs is one of the key stylized facts of international economic development that has allowed the Solow model to become a central component in the debate on the evolution of world inequality.

In response to Romer's challenge to the conventional neoclassical theory of growth, Greg Mankiw, David Romer, and David Weil (1992) developed their "modified" Solow model that can explain international differences in growth rates as the result of convergence to different steady states and is consistent with the idea that "the accumulation of capital broadly defined is the key to international differences in economic growth rates" (Mankiw 1995, 308). However, the biggest push toward integrating the modern analysis of growth and development was given by Robert Barro's (1991) highly influential cross-country regression paper. Barro's cross-country empirical work was firmly embedded in the extended Solow neoclassical model; a major finding from his research is that the "neoclassical model's central idea of conditional convergence receives strong support from the data." As Barro (1997, x) observes, "It is surely an irony that one

of the lasting contributions of endogenous growth theory is that it stimulated empirical work that demonstrated the explanatory power of the neoclassical growth model." While Solow (1999) remains "very suspicious" of cross-country regression results, the new empirical literature focusing on the convergence issue undoubtedly created a synergy between the growth and development literature and was a major influence in placing the Solow model at the heart of modern discussions of economic development, including the SSA "growth tragedy" (Mankiw 1995; Snowdon and Vane 2005).

The Sub-Saharan Growth Tragedy

The lack of significant progress in SSA is *the* outstanding development failure of the last quarter of the twentieth century relative to the expectations and aspirations present at the time of decolonization. This problem remains the greatest development challenge facing the world in the twenty-first century (Easterly and Levine 1997; Artadi and Sala-i-Martin 2003; Sala-i-Martin 2006). As Angus Maddison's (2004) data reveal, although during the relatively stable period, 1950–73, GDP per capita growth in Africa was a respectable 2 percent, this fell to a dismal 0.19 percent for the period 1972–2001. This is in sharp contrast to the well-documented "miracle" growth experienced by the East Asian economies.

The reasons for the poor economic performance of most of SSA since the decolonization period remain highly controversial. Paul Collier and Jan Gunning (1999) consider several plausible explanations:

1. *adverse external influences and conditions* including the legacy of colonialism, slavery (Nunn 2008), "Cold War" politics, and the restrictive trade policies of high income countries;
2. *terms of trade volatility* and heavy dependence on a small number of primary exports;
3. *damaging economic policies*, including protectionism, excessive regulations, fiscal profligacy, incentives to "rent seeking" and "directly unproductive" behavior, hostility toward FDI, and excessive public ownership and statism;
4. *unfavorable demographic factors*, especially rapid population growth;
5. *geographical constraints*, relating to climate, soils, topography and disease ecology, the "natural resource curse," and the problems faced by countries landlocked by hostile neighbors;

6. *internal political instability*, authoritarianism, corruption, bureaucratic inefficiency, poor governance and lack of accountable democratic institutions;
7. *ethnic diversity*, absence of trust and lack of social capital;
8. *lack of adequate physical and social infrastructure*, failure to provide secure property rights and contract enforcement.

While growth theory and the experience of East Asia suggest that SSA countries have enormous potential for catch-up and convergence, this potential is unlikely to materialize in countries with inadequate growth-supporting political and economic institutions. However, Jeffrey Sachs (2005, 2008) has recently become *the* leading advocate of the argument that SSA is caught in a "poverty trap" that requires a "big push" to escape via a substantial increase in foreign aid flows. Moreover, by using modifications to the Solow model to make their case, Sachs et al. (2004) illustrate just how versatile the neoclassical theoretical framework can be when discussing a major issue in development theory and policy.

The Foreign Aid Controversy: From Harrod-Domar to the Solow Model

One long-running controversy in development economics, where the Solow model has now become central to the debate, relates to the role that foreign aid can play in helping low-income countries escape from extreme poverty. While economists agree that a *necessary* condition for the elimination of extreme poverty is sustained economic growth, the idea that a substantial increase in the flow of foreign aid, to regions such as SSA, is necessary to promote such growth remains highly controversial. Indeed the debate relating to the effectiveness of foreign aid in promoting growth and development remains plagued with problems relating to causality, measurement, and ideology (Friedman 1958; Bauer 1971; Easterly 2006b; Riddell 2007).

During the first two "development decades" (1950–70) the case for increasing foreign aid to stimulate economic growth and escape from a low-level equilibrium initially centered on the H-D model rather than the Solow model. The "capital fundamentalism" of the H-D model became a key ingredient within the framework of development planning and the estimation of aid requirements. The implications of this simple growth model were dramatic and somewhat reassuring. The problem of generating an increase in economic growth could be achieved by simply increasing the resources devoted to capital accumulation.

The familiar H-D growth equation, $G = s/v$, simply states that the growth rate (G) of GDP is jointly determined by the savings ratio (s) and the incremental capital-output ratio (ICOR = v). The higher the savings (investment) ratio and the lower the ICOR, the faster will an economy grow. For example, if a developing country desired to achieve a target growth rate of per capita income, $\Delta(Y/P)$, of 2 percent per annum (i.e., a growth target that will ensure that living standards double every thirty-five years), and population (P) is estimated to be growing at $n = 2$ percent per annum, then economic planners could calculate the savings rate required to achieve a target rate of aggregate GDP growth (G^*) equal to 4 percent according to equation (1).

$$G^* = [\Delta(Y/P) + n] = s^*/v. \tag{1}$$

If $v = 4$, this implies that G^* will be realized only with a desired savings ratio (s^*) of 0.16, or 16 percent of GDP (i.e., $G^*v = s^*$). If $s^* > s$, there is a "savings (foreign exchange) gap," and planners would need to devise policies to plug this gap (Chenery and Strout 1966). If domestic sources of finance proved inadequate to achieve G^*, then foreign aid could fill the savings gap. As (2) illustrates, aid requirements (Ar) could simply be calculated as $s^* - s = Ar$.

$$G^* = [s + Ar]/v_1 = s^*/v. \tag{2}$$

It is assumed in such formulations that the boost given to growth by an injection of aid resources will eventually cause a jump in the domestic savings rate such that self-sustaining growth is achieved, thereby ending the need for further aid inflows.

However, a major weakness of the H-D approach is the assumption of a stable ICOR. Aid inflows are likely to raise the ICOR (lower the productivity of capital) as a result of channeling aid into easy-to-monitor, large, prestigious projects that will stand as monuments to the generosity of the politically motivated donors (Griffin 1970). Economists soon became aware of a second major flaw in the "aid requirements" or "financing gap" model. The model assumes that aid inflows are channeled into investment, one-to-one. But it quickly became apparent that foreign aid, with the objective of closing the savings gap, did not necessarily boost total savings and in many cases reduced domestic savings (Easterly 2006b). This is equivalent to a proportion (α_c) of the aid inflow being consumed, that is, aid is highly *fungible* (see Griffin 1970; Boone 1996). As equation (3) illustrates, if aid has a negative impact on the ICOR, and a significant proportion of

the aid is consumed, the impact of aid on growth is substantially reduced and could even be negative.

$$G = [s + (1 - \alpha_c)Ar]/v_2, \tag{3}$$

where α_c is large, and $v_2 > v_1$. In this "pessimistic" scenario, G^* is unlikely to be achieved via attempts to boost domestic savings with inflows of foreign aid (Snowdon 2007).

Ignoring these early doubts, the case for increasing foreign aid has reemerged as a major international policy issue and is linked, via modifications to the standard Solow model, to the idea that some developing countries are trapped in a permanent condition of poverty.

Poverty Traps, Foreign Aid, and the Sachs-Solow Model

In a recent influential paper, Jeffrey Sachs et al. (2004) argue that most SSA countries are caught in a "poverty trap" that is heavily influenced by geographically rooted low agricultural productivity, heavy disease burdens, and relative physical isolation. In such circumstances, the optimistic neoclassical vision that market forces combined with improved governance can remedy the development problem in many very poor countries, irrespective of their initial poverty, is rejected. A practical solution requires targeted investments, large in scale and financed by foreign aid, in infrastructure, disease control, and selective measures to promote a "green revolution" in agriculture.

That poor countries can be caught in a poverty trap is of course an old idea in economics, dating back at least to 1798 and the work of Thomas Malthus. During the 1950s this idea was revived by Ragnar Nurkse (1953) as the "vicious circle of poverty" model, and also in the influential paper by Richard Nelson (1956), whose theory of a "low level equilibrium trap" was used to explain persistent poverty. Nelson suggests that "foreign assistance, together with internal change, can play an important role in boosting an economy from the hold of the trap" (904).

Poverty traps (multiple equilibria) represent self-reinforcing inefficient steady-state equilibria at low levels of per capita income and can arise from a variety of sources, including both market and institutional failure (Azariadis and Stachurski 2005; Azariadis 2006). Paul Collier (2007) identifies four significant "traps" that ensnare the "bottom billion" of the world's population, namely, "internal conflict traps," "natural resource

traps," "landlocked by bad neighbour traps," and "bad governance traps." One of the simplest and best-known poverty-trap mechanisms runs from extreme poverty to low rates of domestic saving and capital accumulation, to low or negative rates of growth of productivity (Ben-David 1998). In an open economy setting, with no restrictions on capital mobility, we should expect to see, ceteris paribus, capital flowing from rich to poor countries, attracted by higher potential returns, thereby accelerating capital accumulation. However, in reality, poor infrastructure, high rates of corruption, and political instability, by lowering the risk-adjusted rate of return to capital, discourage such FDI flows, thereby explaining the "Lucas paradox" (Lucas 1990).

Another potential poverty-trap mechanism arises from the inefficient operation of shallow financial markets in poor countries. Because credit and insurance markets are plagued by informational imperfections, risk-averse lenders require collateral before they are willing to make loans. Unfortunately, the poor obviously lack assets that they can use as collateral and remain credit constrained. Costas Azariadis and Allan Drazen (1990) argue that credit rationing, because of a lack of "financial depth," reduces investment in human capital with important adverse consequences for economic growth (De Soto 2000).

Sachs et al. (2004) argue that the solution to SSA's poverty trap lies in the initiation of a temporary "big push" on the investment front leading to a "step" increase in underlying productivity and a take-off into sustained growth. Given the nature and dynamics of the poverty trap, this big push requires substantial external assistance in the form of a Marshall Plan for SSA. To support their case Sachs et al. use modified versions of the Solow neoclassical growth model that include "*critical thresholds* . . . that must be reached before the forces of standard competitive theory take hold" (Bowles, Durlauf, and Hoff 2006).

The standard Solow growth model is built around the familiar neoclassical aggregate production function (4) and focuses on the *proximate* causes of growth:

$$Y = A_t F(K, L), \tag{4}$$

where Y is real output, K is capital, L is the labour input, and A_t is a measure of exogenously determined "technology." The aggregate production function is assumed to be "well-behaved," that is, it satisfies the following three "Inada" conditions (Barro and Sala-i-Martin 2005). First, for

all values of $K > 0$ and $L > 0$, $F(\bullet)$ exhibits positive but diminishing marginal returns with respect to both capital and labor, that is, $\partial F/\partial K > 0$, $\partial^2 F/\partial K^2 < 0$, $\partial F/\partial L > 0$, and $\partial^2 F/\partial L^2 < 0$. Second, the production function exhibits constant returns to scale such that $F(\lambda K, \lambda L) = \lambda Y$, that is, raising inputs by λ will also increase aggregate output by λ. Letting $\lambda = 1/L$ yields $Y/L = A_t F(K,/L,1/L)$. This assumption allows (4) to be written down in intensive form as (5) where y = output per worker (Y/L) and k = capital per worker (K/L):

$$y = A_t f(k), \text{ where } f'(k) > 0, \text{ and } f''(k) < 0 \text{ for all } k. \tag{5}$$

Equation (5) states that, for a given technology (A_t), output per worker is a positive function of the capital-labor ratio and exhibits diminishing returns. Third, as the capital-labor ratio approaches infinity ($k \rightarrow \infty$) the marginal product of capital (*MPK*) approaches zero; as the capital-labor ratio approaches zero, the marginal product of capital tends toward infinity ($MPK \rightarrow \infty$). The standard diagrammatic representation of the Solow model embraces the intensive form of the neoclassical aggregate production function that satisfies the above conditions. In a recent comment on these conditions, Sachs recalls that it took him twenty years to fully appreciate the implications of these mathematical properties of the neoclassical production function (Snowdon 2007).

How does capital accumulate? Where s = the domestic savings rate, n = the rate of population growth, and δ = the rate of depreciation, and dk/dt = *capital deepening*, then the well-known fundamental differential equation of the Solow model is given by (6):

$$dk/dt = sAf(k) — (n + \delta)k. \tag{6}$$

The *capital widening* term $(n + \delta)k$ indicates the investment (saving) per worker necessary to hold the capital-labor ratio constant. In the Solow model, as long as $sAf(k) > (n + \delta)k$, output per worker will grow. When $sAf(k) = (n + \delta)k$, an economy has reached a steady-state equilibrium.

Sachs et al. (2004) argue that the textbook neoclassical growth model is a "special case" and the actual behavior of an economy at very low levels of output per worker is very different from the one portrayed in the standard neoclassical model in three important ways:

1. While in the conventional Solow model the *MPK* is nearly infinite at very low levels k, in reality, because production processes require a "minimum threshold of capital" (k^T), *MPK* is also low in poor

countries. Therefore, without the presence of basic infrastructure (roads, human capital, etc.) the productivity of small increments of k will be negligible. In figure 1, dk/dt only becomes positive above point k^T, and at low levels of k there are increasing returns to capital accumulation due to a *nonconvexity* in the production function.

2. As shown in figure 2, when k is very low, the savings rate is likely to be low, or even negative, because very poor people need to consume all of their income just to survive. However, saving increases with higher levels on output (income) per worker (capita), forming an "S" shaped function. With $sAf(k)$ less steep than $(n + \delta)k$ at low levels of k, then dk/dt is again negative below point k^T (Solow, 1956, also discusses alternative configurations of the savings function).
3. A third factor likely to prevent capital accumulation at low levels of k is rapid population growth. There is a strong correlation between low income per capita and fertility rates, and poor people, for perfectly rational reasons, aim to have large numbers of children. Figure 3 illustrates a Solow model with a demographic trap. Note how the $(n + \delta)k$ function is very steep at low levels of k. Therefore dk/dt is again negative below k^T.

While Sachs et al. argue that in very poor countries the "capital thresholds, savings traps, and demographic traps" are all likely to interact to produce a powerful "poverty trap," throughout their discussion they refer only to the "standard neoclassical model," never mentioning or citing Solow's 1956 paper. In doing so they miss the opportunity to note that Solow also considered nonstandard outcomes.[2] Indeed, as early as 1958, John Buttrick's *Quarterly Journal of Economics* paper demonstrated the relevance to development economics of the possibility of multiple equilibria in the Solow model.[3]

While the influential arguments of Sachs have provided a rallying point for the pro-aid lobby, many economists remain unconvinced that foreign

2. Solow (1956, 71) notes that "the steady adjustment of capital and output to a state of balanced growth comes about because of the way I have drawn the productivity curve." He also considers the impact of a "variable saving rate" (87–89) and "variable population growth" (90–91).

3. I am grateful to an anonymous referee who drew my attention to Buttrick's paper.

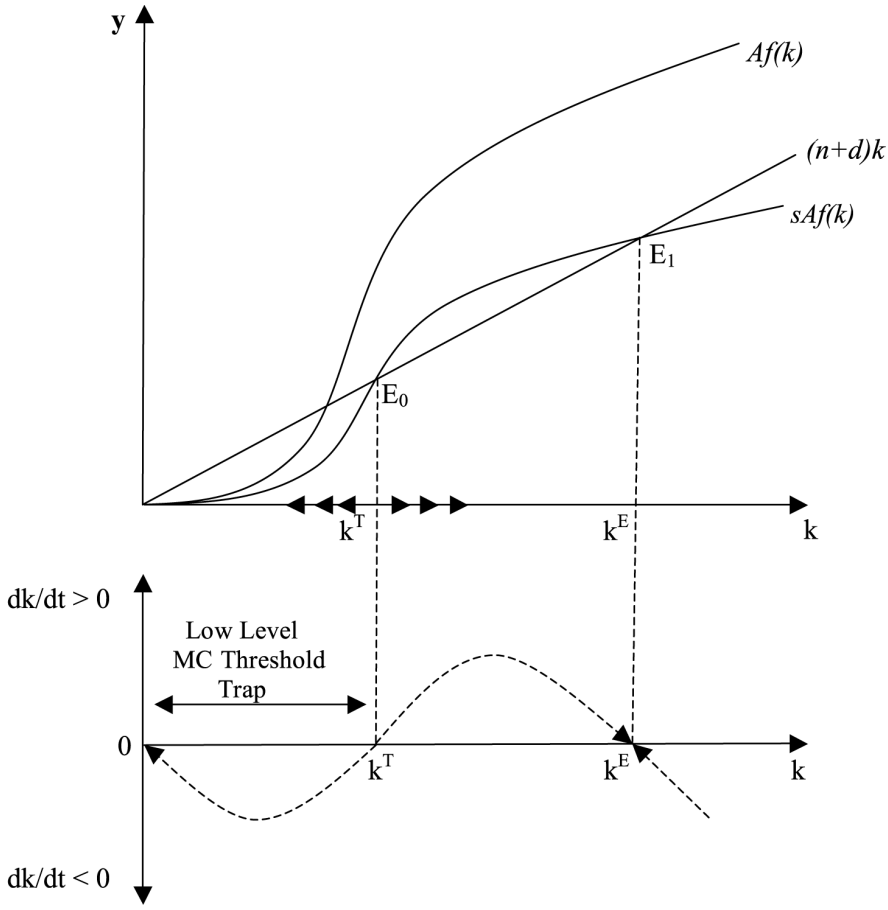

Figure 1 The Solow model with a minimum capital stock threshold. Adapted and extended from Sachs et al. 2004.

aid is either necessary or sufficient for successful growth and development. Aart Kraay and Claudio Raddatz (2007) find little evidence supporting the existence of poverty traps, in their extensive survey of the literature. Azariadis and Jan Stachurski (2005) note that there are a large number of self-reinforcing mechanisms that can interact and potentially cause a poverty trap. In such cases, policy shocks will have "large and permanent

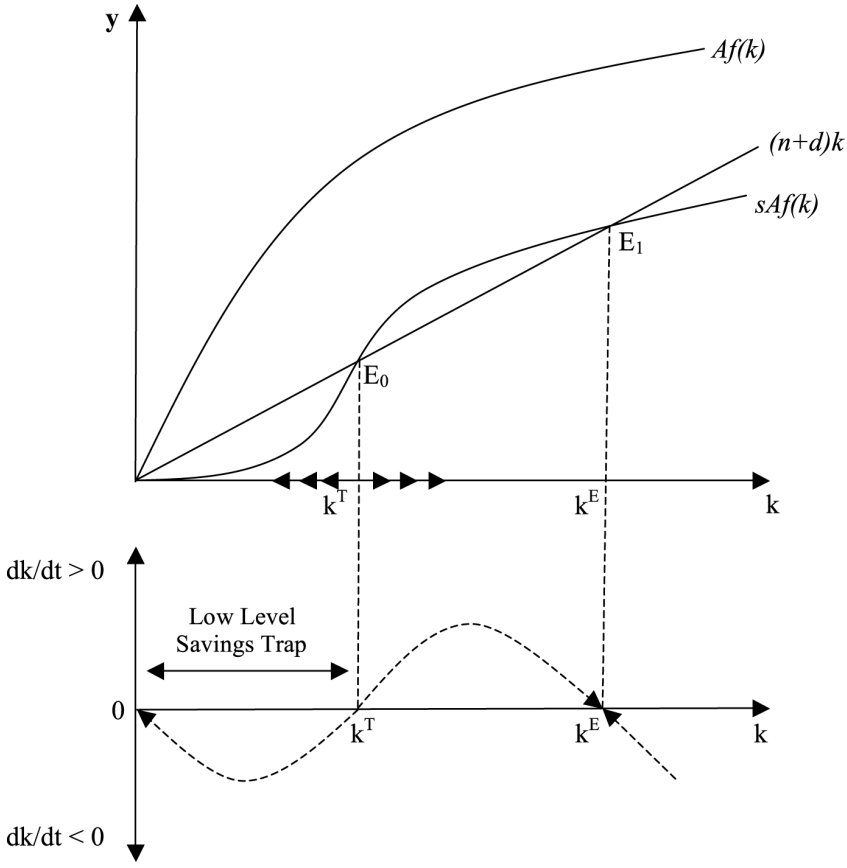

Figure 2 The Solow model with a savings trap. Adapted and extended from Sachs et al. 2004.

effects if one-off interventions can cause the formation of new and better equilibria." However, they also recognize that engineering such an outcome to achieve a more efficient equilibria in practice is very problematic, given the perverse influence of the prevailing structure of incentives in many developing countries, together with problems of corruption and the lack of information facing policymakers.

There is considerable variation in the motivation and behavior of aid donors, and the research of Alberto Alesina and David Dollar (2000) confirms that the criteria for bilateral aid allocations are dominated as much

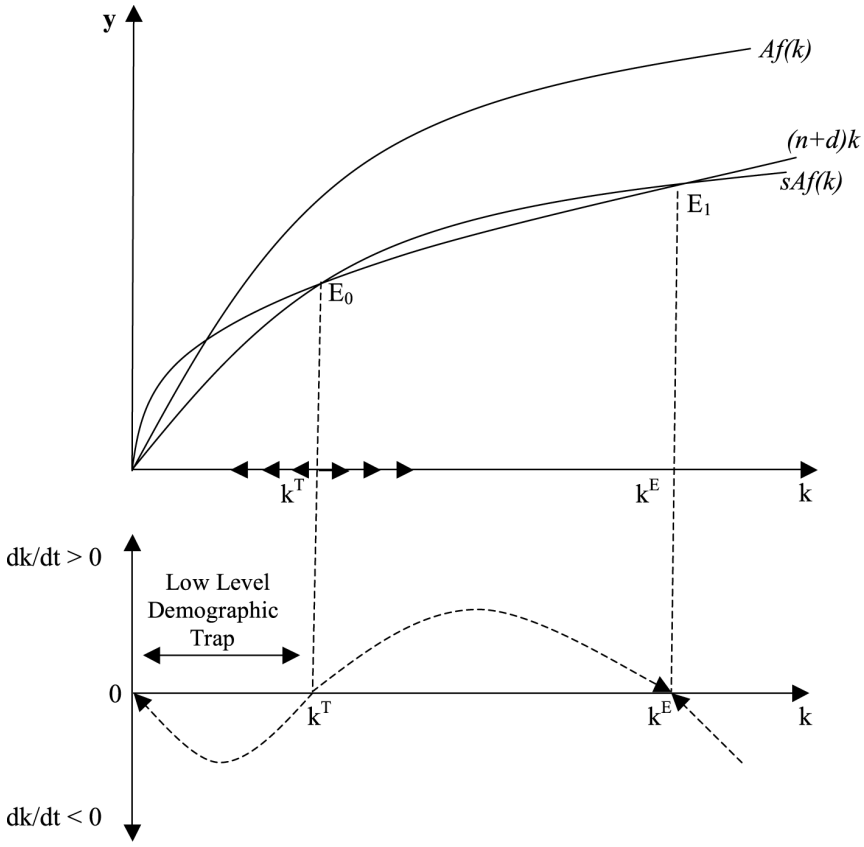

Figure 3 The Solow model with a demographic trap. Adapted and extended from Sachs et al. 2004.

by political and strategic considerations as they are by considerations of economic development. Alesina and Beatrice Weder (2002) demonstrate that there is no evidence that less corrupt governments receive more foreign aid than highly corrupt governments, and Jacob Svennson (2000) also provides evidence that inflows of foreign aid are associated with increased corruption and rent-seeking behavior, especially in countries where there are competing social groups.

According to the critics of aid, "capital fundamentalism" and the "aid-financed investment fetish" have led policymakers up the wrong

path in their "elusive quest for growth." Indeed, Easterly (2006a, 2006b) argues that although the H-D model died long ago in academia, it is still influential among economists working in the major international financial institutions who continue to employ the H-D–Chenery-Strout methodology to calculate the investment and aid requirements needed for specific countries to achieve their growth targets. However, Easterly argues that the evidence that aid flows into investment on a one-for-one basis, and that there is a fixed linear relationship between growth and investment in the short run, is "soundly rejected" (see also Burnside and Dollar 2000; Easterly, Levine, and Roodman 2000; Rajan and Subramanian 2005).

To date, the "top down," "mega reform," planned administrative approach to solving the problem of world poverty involving large increases in the flow of foreign aid has not been a success (Easterly 2006a). What is the alternative? Easterly advocates a piecemeal gradualist "bottom up" approach in the spirit of Edmund Burke and Karl Popper. However, Easterly does concede that aid *could* be useful in achieving more modest objectives than Rostovian "take-offs" into "self sustaining growth," *if* incentive structures at ground level were improved and *if* the existing bureaucratic flaws within the international aid agencies could be corrected.

From Solow to the Fundamental Determinants of Growth

In the most recent wave of growth theory and empirics, modern political economy models have been used to investigate the *deeper* or *fundamental* determinants of growth, something the Solow model does not and was not designed to address. A major problem with formal growth models that focus on the *proximate* determinants of growth is that they necessarily ignore factors such as the influence of history, path dependency, ethnolinguistic fractionalization, and the numerous political and economic barriers to reform. Fortunately, recent political economy models of growth focus on factors such as the quality of governance, the origins of the legal system, ethnic diversity, social cohesion, democracy, trust, corruption, path dependency, political barriers, and institutions in general (Helpman 2004; Acemoglu 2008). Consequently, some of the most exciting developments in recent years have been those emerging as a result of the remarkable coming together of the fields of economic growth, economic development, and economic history. This has led to several insightful

political economy contributions to our understanding of the deeper (fundamental) determinants of long-run economic growth and development. Key insights have emerged from the research of such scholars as Douglass North (2005), Dani Rodrik (2007), and Daron Acemoglu and James Robinson (2006).

Although there is obviously a great deal of interaction among the numerous factors influencing growth, perhaps the most promising framework for analyzing SSA's growth tragedy is one that emphasizes the role of institutions and political constraints. Rodrik (2007) has emphasized the importance of embedding a market economy within a set of nonmarket institutions and identifies five key institutions, namely, "property rights; regulatory institutions; institutions for macroeconomic stabilisation; institutions for social insurance; and institutions for conflict management." However, it is important to emphasize that these institutions "are not uniquely determined," and Rodrik rejects the discredited "neoliberal social-economic model" associated with the more extreme versions of the Washington Consensus.

While the World Bank (2002) is giving increasing emphasis to the growth-retarding impact of weak institutions, and many economists are now persuaded that the incentive structure created by the institutional environment must be a key ingredient that determines the success or failure of countries in their "elusive quest for growth," there remains little consensus on the precise channels of causation running from institutions to economic growth. As Elhanan Helpman (2004) observes, "The study of institutions and their relation to economic growth is an enormous task on which only limited progress has been made so far."

To understand the political roots of economic success remains a crucial research area for economists, and the recent work of Acemoglu and North, and their coresearchers, is making a substantial contribution in this area (Acemoglu and Robinson 2006; North et al. 2007). A major problem facing almost all developing countries is how to make the formidably difficult transition from their current politico-economic status as "*limited access orders*" to becoming "*open access orders*" (North et al. 2007). Limited access orders are those where "social, economic, and political systems are based on limited entry and rent creation," while open access orders are characterized by the rule of law and open competition in both the political and economic spheres. While there may be leeway for aid to perform a role in the more "mature" limited-access societies, in fragile limited-access orders aid inflows could very well be highly destabilizing.

Conclusion

Fifty years on, the idea that many low-income countries in SSA are caught in a poverty trap is once more popular among economists who advocate some form of global Marshall Plan to defeat poverty. Sachs et al. (2004) reject the orthodox Solow model as a useful framework of analysis for poor countries because its key assumptions rule out the possibility of a poverty trap. While the three poverty-trap mechanisms built into the Solow model and highlighted by Sachs have intellectual appeal and are theoretically plausible, the lack of any systematic empirical evidence supporting them suggests that a very cautious response is appropriate to appeals for substantial increases in aid as a viable solution to SSA's poverty. There are numerous examples of countries (including the United Kingdom and United States) that have escaped from poverty via sustained growth where foreign aid has played little or no part. Furthermore, large inflows of aid, of the volume envisaged by Sachs, are not a dominant feature of the thirteen countries that have sustained rapid growth during the last forty years discussed in the 2008 *Commission on Growth and Development Report* (a commission, by the way, of which Bob Solow was a member).

The most significant barriers to economic progress in much of SSA have their origin in the destructive dynamics of internal political conflict combined with dysfunctional institutions and misguided economic policies, rather than minimum capital threshold, saving, and demographic poverty traps. Inefficient institutions, created and perpetuated by elites, are a major barrier to progress in many developing countries. As economists we should not be surprised when aid flowing into an environment dominated by mismanaged or corrupt institutions and inadequate governance fails to deliver a virtuous circle of enlightened reforms and the Holy Grail of sustained economic growth. In reality, the economic history of the world has repeatedly demonstrated how political barriers prevent economic progress. Nowhere is this problem more acute than in SSA.

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